Stewart

HENDERSONIA BLIGHT OF LODGEPOLE PINE IN IDAHO

R. L. James
Plant Pathologist

Cooperative Forestry and Pest Management
USDA Forest Service
Northern Region
Missoula, Montana

January 1984

Investigations were conducted on an interesting needle disease of lodgepole pine (Pinus contorta Dougl.) recently found on the St. Maries Ranger District, Idaho Panhandle National Forest. This disease caused a blight to and premature loss of second-year foliage. Affected needles had a distinct bluish-grey necrotic band in the center (figures 1 and 2). Distal to the greyish band, needle tips were often reddish-brown (figure 2). A band of reddish-brown necrotic tissue was also common just proximal to the grey zone. Needle tissues near the fascicle sheath were often light green. A distinct black line often delimited necrotic from green tissues. Within the grey necrotic zones, crusts of black spores were visible on the surface of infected needles (figure 2). These spore crusts were especially common on the underside of needles.

Examination of spores from these black crusts indicated that they were from the genus Hendersonia. Spores were fusoid-ellipsoid, mostly four-celled, with reddish-brown pigment, and a slight constriction at each septum (figure 3). Spores measures 5.5-6.8 u in width and 15.5-22.0 u in length (average 6.3 x 19.6 u).

Pycnidia producing these spores were totally immersed within host mesophyll tissues (figure 4). They measured 125-150 u in diameter. No well-developed fungal stromatic tissues were evident around the immersed pycnidia. Conidia were produced on short, hyaline conidiophores around the periphery of the pycnidial cavity. Mature conidia were exuded through a minute ostiolar opening of the pycnidium that penetrated the host epidermis (figure 5). Spores were apparently coated with a self-adhering material that allowed them to form crusts just outside the pycnidial ostiole. When wettened, individual spores would separate from these crusts.

Spores from pycnidia produced within necrotic needles were germinated on 2 percent water agar incubated under cool fluorescent light at 25° C. After 21 hrs.' incubation, 100 spores were randomly selected to evaluate germination. Results are summarized in table 1. Ninety-six percent of the spores observed had germinated, i.e., produced a noticeable germ tube. Most (90 percent) of the spores sampled were four-celled; half of these produced only one germ tube, less than half produced two germ tubes (figure 6), and very few produced three germ tubes. A small percentage of sampled spores were two- or three-celled; most of these produced only one germ tube.

Single-spore isolates were prepared and grown on potato dextrose agar under cool fluorescent light at 25° C. Growth was very slow (about 0.6 mm/day) over the agar surface. Colonies were convoluted with a white margin (figure 7). Older hyphae became olivaceous brown with distinct barrel-shaped cells with constrictions at septa. Pycnidia were produced within older parts of colonies after about 10 days (figure 7). Pycnidia were globose, black, with a papillate ostiole, and were either formed singly or grouped together within black stromata. Three days after they appeared, pycnidia produced abundant, normal-appearing spores. Olivaceous hyphae and pycnidia were underlain with hard crust-like stomata.

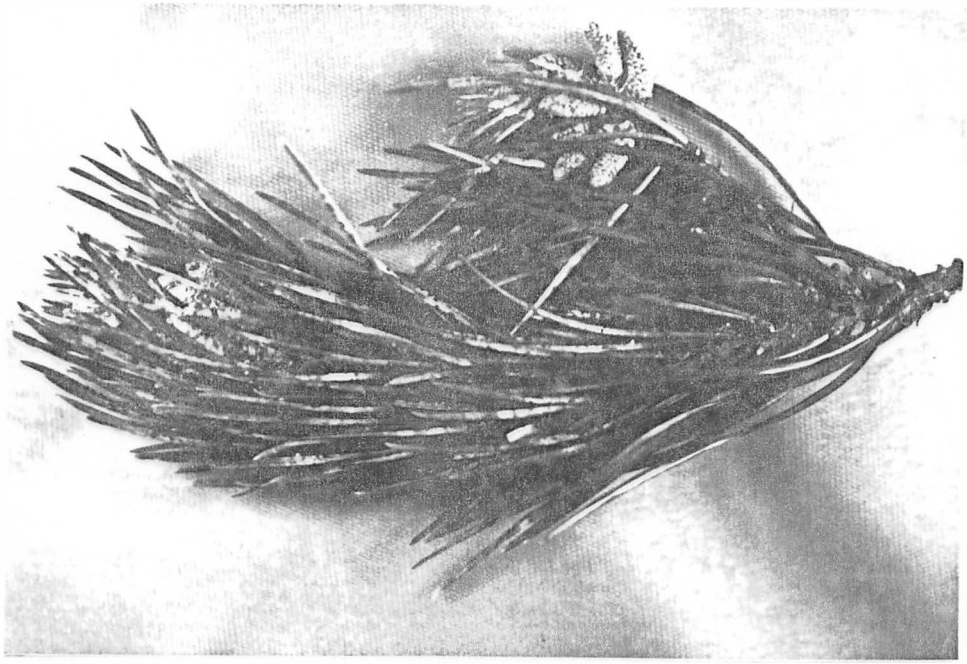

Figure 1.--Hendersonia blight of lodgepole pine needles. Second-year needles were affected.

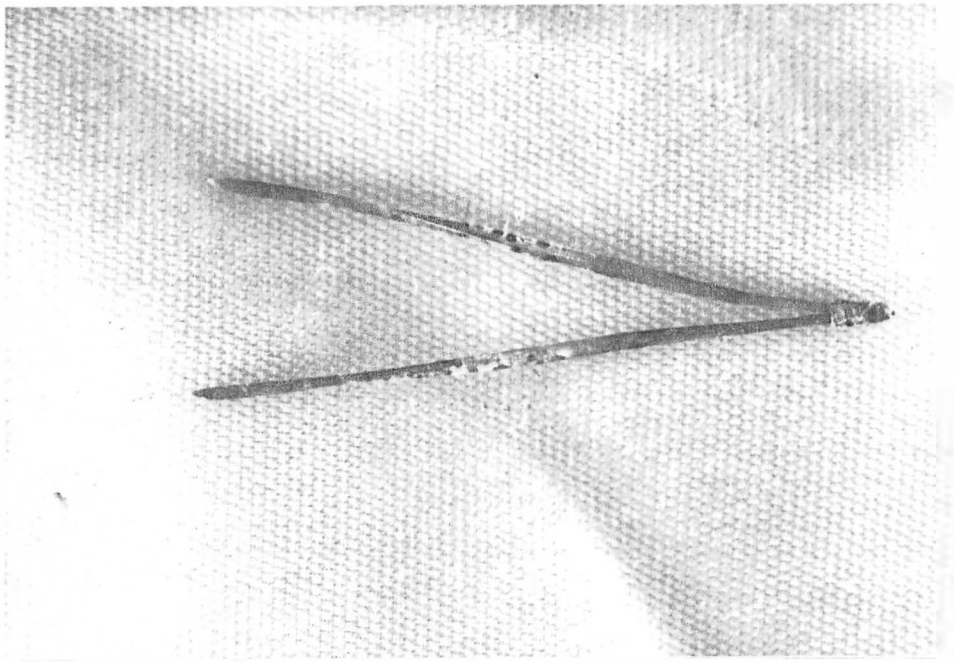

Figure 2.--Hendersonia blight of lodgepole pine needles. The pathogen was located within the greyish necrotic zone in the middle of needles. Black crusts of spores were evident within the grey zone.

Figure 3.--Conidia of Hendersonia pinicola produced on necrotic needles of lodgpeole pine (X1,000). These fusoid-ellipsoid conidia were mostly four-celled with reddish-brown pigment and a slight constriction at each septum.

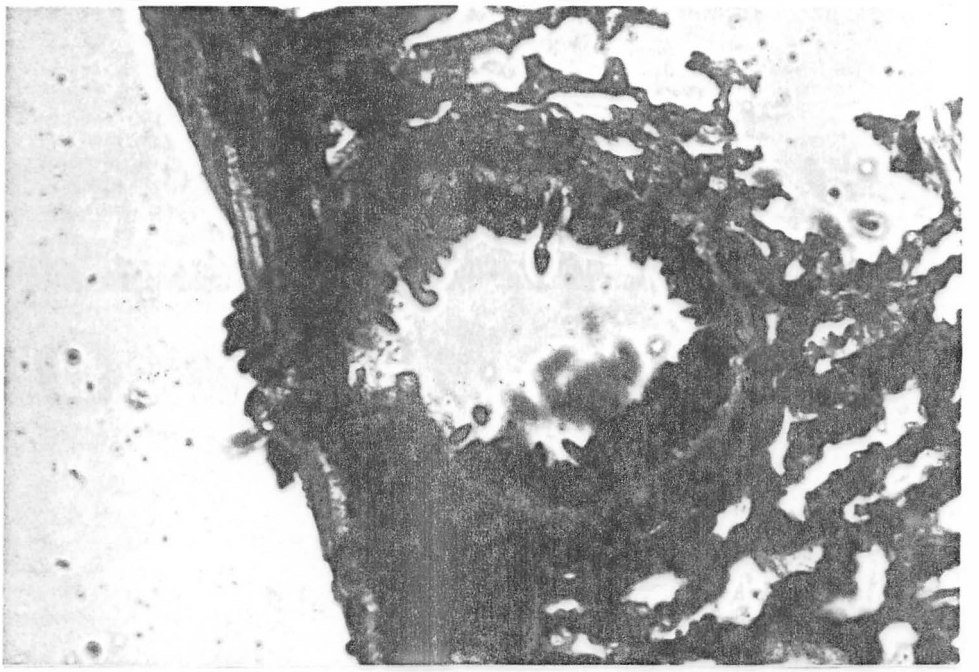

Figure 4.--Pycnidium of Hendersonia pinicola completely embedded within mesophyll tissues of lodgepole pine needles (X200). No well-developed fungal stromatic tissue was evident around pycnidia.

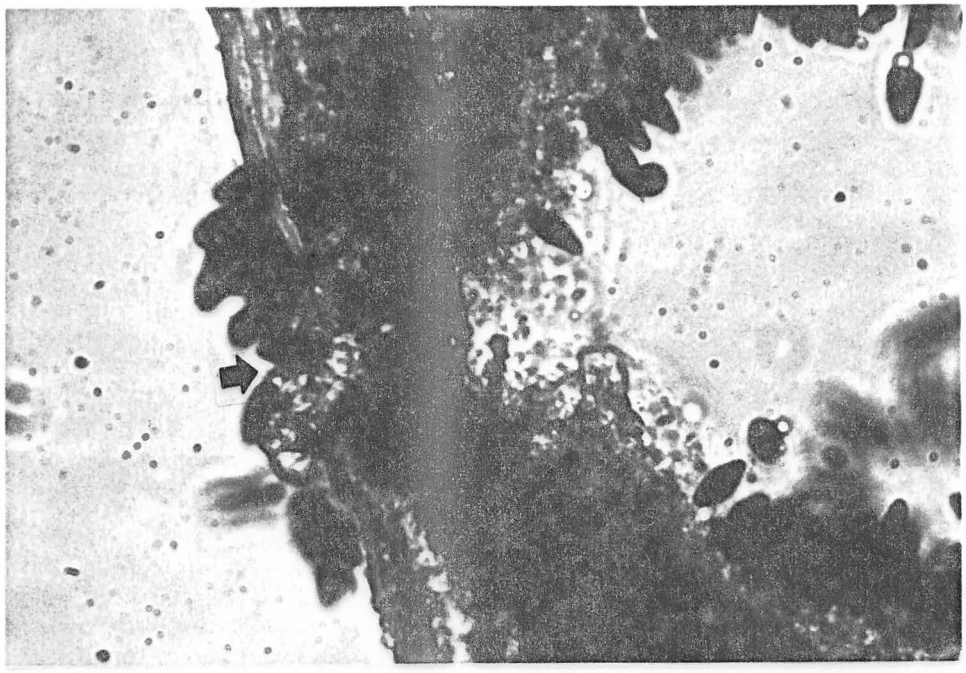

Figure 5.--Ostiole (arrow) of Hendersonia pinicola pycnidium embedded within needle mesophyll tissues of lodgepole pine (X450). Mature spores exuded through the ostiole formed crusts on the outside of host epidermis.

Table 1.--Germination of Hendersonia pinicola conidia on 2 percent water agar incubated under cool fluorescent light at 25° C for 21 hours.[1]

Spore type	Percent of sampled spores	Number of germ tubes		
		One	Two	Three
Four-celled	90	50	47	3
Three-celled	2	50	50	0
Two-celled	8	100	0	0

[1]Figures in table indicate percent of samples spores.

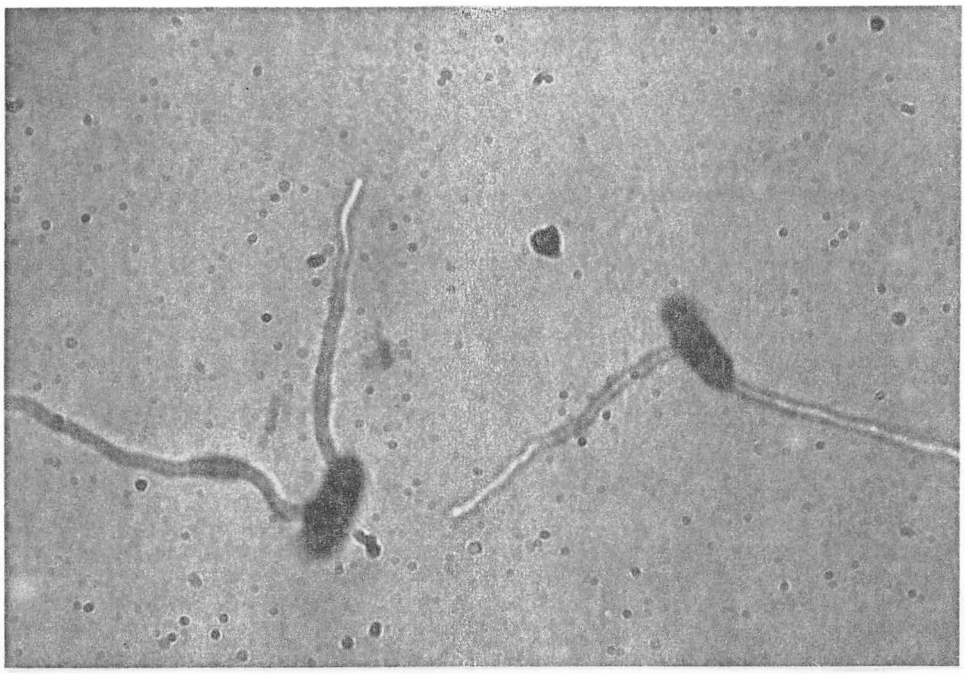

Figure 6.--Conidia of Hendersonia pinicola germinating after 21 hrs.' incubation under light at 25° C (X450). Two germ tubes produced from each conidium; germ tubes arose from different cells.

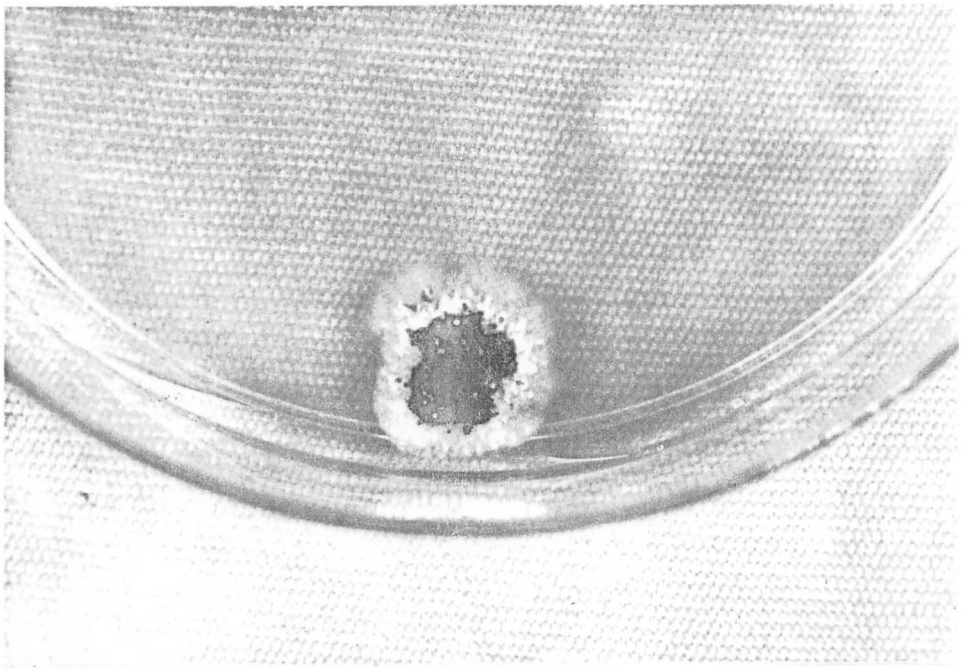

Figure 7.--Colony of Hendersonia pinicola on potato dextrose agar after 13 days' growth at 25° C. Pycnidia were abundantly produced on the surface of the colony or within stromata.

The fungus found on lodgepole pine needles from Idaho was probably Hendersonia pinicola Wehm., as described by Wehmeyer (1946b). This fungus was previously reported in the western United States on several pine species, including lodgepole pine (Hedgecock 1932; Hepting 1971; Shaw 1973; Wehmeyer 1946a & b). It closely resembles H. acicola Munch. Tub., a European species that attacks pines (Lagerberg 1910; Laing 1929; Peace 1962).

The major differences between H. pinicola and H. acicola are that spores of the latter are somewhat smaller with greater constrictions at the septa (Wehmeyer 1946b). European workers state that H. acicola is usually associated with and may be the imperfect state of the needle cast fungus, Hypodermella sulcigena (Rostr.) Tub. (Lagerberg 1910; Peace 1962; Watson and Millar 1971). No such relationship has been reported for H. pinicola on lodgepole pine. However, Staley and Bynum (1972) reported an undescribed species of Hendersonia as a secondary colonizer of ponderosa pine needles infected with Lophodermella morbida Staley & Bynum.

Hendersonia blight was fairly common on lodgepole pine in northcentral Idaho during 1983. Perhaps some pine foliage discoloration and defoliation attributed to Lophodermella concolor (Dear.) Dark. in the past was due to H. pinicola. These two pathogens cause enough symptom differences to allow for separation when infected foliage is carefully examined.

LITERATURE CITED

Hedgcock, G. G.
1932. Notes on the distribution of some fungi associated with diseases of conifers. Plant Dis. Reptr. 16: 28-42.

Hepting, L. E.
1971. Diseases of forest and shade trees of the United States. USDA Forest Service, Agric. Handbook 386. 658 pp.

Lagerberg, T.
1910. Om grubarrsjukan hyos tallen dess orsak och verkningar. Skogsr. Tidskr. Fack. (Meddel. Fran Statens' Skogsu.) 8: 221-242, 357-382.

Laing, E.V.
1929. Notes from the Forestry Department, Aberdeen University. Soct. For. J. 43: 48-52.

Peace, T. R.
1962. Pathology of trees and shrubs with special reference to Britain. Clarendon Press, Oxford. 753 pp.

Shaw, C. G.
1977. Host fungus index for the Pacific Northwest II. Fungi. Wash. St. Agric. Exp. Sta. Bull. 766. 162 pp.

Staley, J. M. and H. H. Bynum.
1972. A new Lophodermella on Pinus ponderosa and P. attenuata. Mycologia 64: 722-726.

Watson, A. R. and C. A. Millar.
1971. Hypodermataceous needle-inhabiting fungi in pines in Scotland. Trans. Proc. Bot. Soc. Edinb. 41: 250.

Wehmeyer, L. E.
1946. Studies on some fungi from northwestern Wyoming. I. Pyrenomycetes. Mycologia 38: 144-170.

Wehmeyer, L. E.
1946. Studies on some fungi from northwestern Wyoming. II. Fungi Imperfecti. Mycologia 38: 306-330.